4.9 IMPACTS ON INFRASTRUCTURE

The Proposed Action and its alternatives would affect water, wastewater, and stormwater infrastructure systems. Each alternative would place increased, localized demands on existing city infrastructure. This analysis uses an ROI defined by the sites of the Proposed Action and its alternatives to evaluate direct impacts. Site-specific increases in utility demands may also produce indirect and cumulative impacts. Increased utility use at project sites may affect service provision in other areas of the city of Biloxi utility network. Secondary growth induced by the Proposed Action or its alternatives would also produce higher demands on infrastructure throughout the coastal region. These indirect and cumulative impacts are analyzed across an ROI that includes the city of Biloxi and the three-county region.

4.9.1 Impacts on Water Supply

The Proposed Action and its alternatives would increase potable water use, affecting on-site infrastructure, as well as municipal and regional water systems. This section assesses the anticipated environmental effects of additional water use. Section 4.3 evaluates the impacts of increased water demand on available groundwater supply. Direct and indirect effects of the alternatives are described below.

4.9.1.1 Direct Impacts

The direct effects of the Proposed Action and its alternatives on the water supply include: requiring infrastructure upgrades for the delivery of adequate water service to project sites, and increasing potable water demand and fire flow requirements during operational phases. Potable water demand includes water for hotel guests, food and beverage preparation, pool use, and gaming and retail activities. Estimates of potable water demand do not include water for irrigation.

Assumptions used to calculate estimated potable water demand for each alternative are: average daily flow of 230 gpd/hotel room; average daily flow of 200 gpd/1,000 square feet of casino, retail, and food and beverage space; average daily flow of 45 gpd/marina slip; and average daily flow of 5 gpd/seat in the theater component (Ivey, Harris, and Walls, Inc., 1998). Fire flow refers to the availability of water at a quantity and water pressure sufficient for fire protection purposes. Required fire flow is expressed in gallons per minute and is based on an Insurance Services Office (ISO) formula and NFPA building construction codes. Appendix I contains detailed calculations of potable water and fire flow requirements.

The construction phase of the Proposed Action or its alternatives could require city of Biloxi water system improvements to accommodate increased water demand and fire flows. System improvements may include increased transmission main sizes to the site, the addition of water storage and pumping capacity, and the addition of wells to extract larger quantities of groundwater. Infrastructure installation would produce a variety of direct environmental impacts, including the acquisition of utility rights-of-way and construction easements, the relocation of existing utility lines, the use and storage of heavy construction equipment, soil erosion resulting

from the digging of utility trenches, and possible short-term disruptions to the road network and existing utility services. The system improvements identified below are strictly preliminary. Additional technical investigations would be required to determine actual system modifications required.

Alternatives 2, 4, and 5

During operation, Alternatives 2, 4, and 5 would have an average daily potable water demand of 1.84 mgd and require fire flow ranges between 1,250 and 4,750 gpm. These alternatives would concentrate this increased water demand at the existing Broadwater site. To accommodate projected demand, infrastructure at the site would be improved by increasing the existing 12-inch transmission line to a 20-inch line and adding approximately three wells with a capacity of 1,000 gpm, as well as a storage tank (personal communication, J. Porche, City Engineer, City of Biloxi, MS, to E. Drake, EDAW, Atlanta, GA, September 30, 1999).

Alternative 3

Alternative 3 would produce the same overall potable water use as Alternatives 2, 4, and 5 (1.84 mgd average daily flow), but increases would occur at multiple points in the city water supply network. Dispersing water demand would reduce the extent of infrastructure upgrades at any particular site. The lower intensity of development at any given site would also decrease the range of required fire flows (1,250-3,500 gpm). Overall, however, Alternative 3 would require significant infrastructure improvements at all sites, including an increase in existing transmission main sizes to a minimum of 12 inches, the addition of several wells, and at least two storage tanks in the east peninsula (personal communication, J. Vorpahl, City of Biloxi, MS, to E. Drake, EDAW, Atlanta, GA, December 9, 1999).

The Bayview Avenue project (see Figure 3.8-3) may also present an opportunity to coordinate needed infrastructure improvements with road widening construction, thereby limiting some of the disruptive impacts of utility installation.

No-Action Alternative

The No-action Alternative uses an average of approximately 0.13 mgd of potable water. This estimated no-action demand is based on current hotel, food and beverage, gaming, and marina space at the Broadwater site. Under the No-action Alternative, some rehabilitation and facility additions could occur at the existing Broadwater site. These improvements could result in increased potable water demand and fire flow and, therefore, require system upgrades. Demand increases would not, however, be of the magnitude generated by the Proposed Action or other alternatives, and any corresponding infrastructure improvements would be less extensive.

4.9.1.2 Indirect and Cumulative Impacts

The water use that would be generated by the Proposed Action and its alternatives could also affect the delivery of potable water to off-site locations. Indirect and cumulative impacts include changes in the overall capacity of the city of Biloxi water supply system and additional demand placed on the available potable water supply within the three-county region.

Higher water use associated with the Proposed Action and its alternatives could affect the city of Biloxi's ability to deliver water to other users in the municipal system. Increased demand at project sites could reduce the available capacity of infrastructure supplying water to nearby properties. An example of the effect of such reduced infrastructure capacity is lowered water pressure at surrounding sites. The Proposed Action and its alternatives, however, could also result in expansion of the city's water provision capabilities. Higher use at project sites could require infrastructure improvements such as new wells and storage tanks or increased transmission line sizes. These system upgrades would provide additional water to nearby sites. Funds generated through gaming tax revenues and utility fees could finance these future system upgrades.

The Proposed Action and its alternatives would contribute to permanent population increases. Project-related population growth would produce higher overall potable water consumption across the three-county region and place greater demand on existing public water supply capacity in Harrison, Hancock, and Jackson counties.

This analysis uses population projections allocated among the three counties to estimate future water withdrawals from public water supplies in Harrison, Hancock, and Jackson counties. The following assumptions are used: per capita water withdrawals of 114.89 gal/day in Hancock County; 181.35 gal/day in Harrison County; and 90.88 gal/day in Jackson County (USGS, 1995). Public water supply withdrawals include water delivered to households, industry, and commercial uses.

Table 4.9-1 presents estimated increases in water withdrawals across the three counties. The 2000 no-action population projection provides the baseline from which 2010 water demand increases are estimated. Under the No-action Alternative, rising potable water use would be a direct result of population growth in the three-county region. Water use increases for Alternatives 2, 3, 4, and 5 reflect this continuing population growth, combined with the additional population impact produced by each alternative. The table also presents the percentage of the existing water supply in the three-county region that would be needed to serve increased water demand in 2010. This analysis does not assume any increase in the regional water supply capacity. Major municipal and private water providers will, however, likely continue the expansion of potable water supply infrastructure in response to population growth.

Table 4.9-1
Projected Increases in Water Withdrawals from Public Water Supplies in the Three-County Region, 2000-2010

Alternative	Projected Increase between 2000-2010 (in mgd)	Increase Over No-Action Alternative (in mgd)	Percent of Current Water Supply in ROI Needed to Serve Increased Withdrawals Resulting from Alternative[1]
1	6.4	0	6.2%
2	10.3	3.9	9.9%
3	10.4	4.0	10.0%
4	10.3	3.9	9.9%
5	10.3	3.9	9.9%

Source: Staff analysis.
1. Overall potable water supply in ROI is equal to 104.47 mgd - the total well field capacity of the city of Biloxi and other major potable water providers as identified in Section 3.9.

Alternatives 2, 4, and 5

Alternatives 2, 4, and 5 would require significant infrastructure improvements at the existing Broadwater site. The addition of transmission, pumping, and storage capacity would enhance the capability of the city's water supply network on the west side of the peninsula. As discussed in Section 4.3, heavy withdrawal on the site, however, could lower water levels in nearby wells.

Alternatives 2, 4, and 5 would increase public water supply withdrawals in the three-county region by approximately 10 mgd over 2000 water use levels. These alternatives add approximately 4 mgd or 60 percent to the water demand increase that would occur under the No-action Alternative. This represents an additional 10 percent of the existing water supply in the three-county region. As discussed in Section 4.3, regional groundwater supply would be adequate to satisfy this increase in potable water demand.

Alternative 3

Under Alternative 3, increased water demand would occur in the east Biloxi peninsula, which has a history of water infrastructure deficiencies. Recent system improvements, however, have enhanced pumping, storage, and transmission capabilities in this part of Biloxi. System improvements to the Alternative 3 sites would further increase water infrastructure capacity. As with Alternatives 2, 4, and 5, the addition of wells at Alternative 3 sites could lower water levels in adjacent municipal wells.

The impact of Alternative 3 on the three-county water supply would have a comparable impact to Alternatives 2, 4, and 5, producing a 10.4 mgd increase in public water supply withdrawals by 2010 and using an additional 10 percent of the currently available water supply in the three-county region.

No-Action Alternative

Under the No-action Alternative, localized increases in water demand and infrastructure upgrades could occur at the existing Broadwater site as the result of future improvements and facility expansions. These improvements, however, would not be of the magnitude of the Proposed Action and other alternatives and, therefore, would have less impact on the overall city of Biloxi water system. The No-action Alternative would not reduce or expand the capacity of the current water supply infrastructure.

Under the No-action Alternative, water demand in the three-county ROI would expand as a result of expected population growth. The estimated increase in water withdrawal resulting from the No-action Alternative is 6.4 mgd, or approximately 6 percent of the available 2010 water supply in the three-county region. Available groundwater supply is adequate to satisfy this increase.

4.9.2 Impacts on Wastewater

The Proposed Action and its alternatives would produce increased amounts of wastewater. This section assesses the anticipated environmental effects on the wastewater management system. The ROI used to evaluate these impacts includes the sites of the Proposed Action and its alternatives, the city of Biloxi, and the three-county region. Direct and indirect effects of the alternatives are described below.

4.9.2.1 Direct Impacts

The direct effects of the Proposed Action and its alternatives on the wastewater system include: increased wastewater flows generated during operational phases; the installation of additional infrastructure for the collection, transport, and treatment of wastewater from project sites; and the reduction of available treatment plant capacity in the HCWSWMD. Assumptions used to calculate estimated wastewater generation include: average daily flow of 200 gpd/hotel room; average daily flow of 200 gpd/1,000 square feet of casino, retail, and food and beverage space; average daily flow of 45 gpd/marina slip; and average daily flow of 5 gpd/seat in the theater component (Ivey, Harris, and Walls, Inc., 1998). Appendix I contains detailed calculations of wastewater demand.

Two general types of wastewater management could be used for the Proposed Action or its alternatives—routing to a centralized wastewater treatment facility or an on-site wastewater facility. Issuance of a USACE permit authorizing development of the Proposed Action or an alternative would not determine the method of wastewater treatment. The Permit Board of the Mississippi Department of Environmental Quality (Permit Board) has the ultimate authority to approve wastewater treatment options for the Proposed Action or its alternatives. This analysis, therefore, will not recommend a single treatment method, but will identify the differing impacts associated with several possible treatment options.

The city of Biloxi could route wastewater flows from project sites to one of two centralized treatment facilities on the peninsula – the Keegan Bayou plant or the West Biloxi plant (see

Figure 3.9-1). This wastewater option would require upgrades to the city's sewer infrastructure, including increases in the size of existing sewer lines, the installation of new transmission force mains, and the addition of lift stations. Possible system improvements identified below are strictly preliminary. Additional technical investigations would be required to determine actual sewer system modifications required by the alternatives.

Infrastructure improvements would produce a variety of direct environmental impacts, including the acquisition of utility rights-of-way and construction easements, the relocation of existing utility lines, the use and storage of heavy construction equipment, soil erosion resulting from the digging of utility trenches, and possible short-term disruptions to the road network and existing utility services. Wastewater generated from the Proposed Action or its alternatives would also use a portion of available treatment capacity and could accelerate the eventual need for an increase in permitted plant capacity. Section 3.9 discusses the current capacity of wastewater treatment facilities.

As a second wastewater management option, the applicant could develop an on-site wastewater treatment facility. The plant would be a totally self-contained, zero-discharge system where effluent would be treated and re-used for irrigation. With this zero-discharge option, no wastewater flows would be added to the city's sewer system or wastewater treatment plants. An on-site wastewater plant is a relatively costly option and would not be feasible for the declustered Alternative 3 sites. This section, therefore, only evaluates on-site wastewater management for Alternatives 2, 4, and 5 at the existing Broadwater site.

Table 4.9-2 shows the percentage of WWTP capacity that would remain after receiving projected average daily wastewater flows from the alternatives. There is no assumed reduction in existing WWTP capacity under the No-action Alternative. Given limited capacity at the West Biloxi treatment plant, the table identifies two possible wastewater routing options for Alternatives 2, 4, and 5 at the existing Broadwater site. Figure 3.9-1 shows these routing options. Wastewater from the Alternative 3 sites would be conveyed to the Keegan Bayou facility for treatment.

Table 4.9-2
Wastewater Treatment Capacity

Alternative	WWTP Receiving Wastewater	Percent of WWTP Capacity Remaining after Average Daily Flow
2	Keegan Bayou	25.7%
2	West Biloxi	-12.6%
3	Keegan Bayou	25.7%
4	Keegan Bayou	25.7%
4	West Biloxi	-12.6%
5	Keegan Bayou	25.7%
5	West Biloxi	-12.6%

Source: Staff analysis.

Alternatives 2, 4, and 5

Alternatives 2, 4 and 5 would generate 1.63 mgd in average daily wastewater flow and 4.90 mgd in peak flow. According to a utility master plan report produced for the Environmental Assessment and interviews with utility service providers and regulators, three feasible wastewater management options exist for the site (Ivey, Harris, and Walls, Inc., 1998; personal communication, P. Vanderfin, Enforcement Officer, HCWSWMD, Gulfport, MS, to E. Drake, EDAW, Atlanta, GA, October 1, 1999; personal communication, G. Odom, MDEQ, Jackson, MS, to E. Drake, EDAW, Atlanta, GA, October 29, 1999):

- Pump wastewater from the Broadwater site to the Keegan Bayou wastewater treatment facility;

- Pump wastewater from the Broadwater site to the West Biloxi wastewater treatment facility; or

- Treat wastewater with an on-site plant.

Given the volume of wastewater generated, Alternatives 2, 4, and 5 would likely be unable to use the city's existing collection system when pumping to a treatment facility (personal communication, J. Porche, City Engineer, City of Biloxi, MS. to E. Drake, EDAW, Atlanta, GA, September 30, 1999). Transmission of wastewater would likely require construction of a dedicated 20-inch sewer line from the Broadwater site to one of the wastewater plants and construction of two triplex pump stations, two duplex pump stations, and five simplex pump stations (Ivey, Harris, and Walls, Inc., 1998). The duplex and simplex stations would pump wastewater into the master triplex stations, which would then pump wastewater from the site to the WWTP.

The West Biloxi plant is closer to the existing Broadwater site. This option would require approximately 12,408 feet of 20-inch piping, approximately 40 percent of the new line required for transmission to the Keegan Bayou WWTP (personal communication, J. Harris, Ivey, Harris, and Walls, Inc., Winter Park, FL, to J. Napoli, President Casinos, Pittsburgh, PA, December 21, 1998). Routing to the West Biloxi facility would, therefore, reduce some of the direct impacts associated with the installation of new transmission lines. As shown in Figure 3.9-1, piping to the West Biloxi WWTP would cross existing Broadwater property, limiting the disruptive effects of construction on public right-of-way. The West Biloxi plant, however, already receives flows near its permitted discharge limitation. West Biloxi would not be able to accommodate projected average daily wastewater flows from Alternatives 2, 4, or 5 without exceeding permitted capacity. Routing wastewater from the Broadwater site to the plant would require an expansion of available treatment capacity. The HCWSWMD could also repump treated water back to the Broadwater site for reuse in irrigation. The potential for water reuse, however, is low (Ivey, Harris, and Walls, Inc., 1998).

Diverting current wastewater flows from West Biloxi to another treatment facility in the HCWSWMD could increase available capacity without plant expansion. HCWSWMD has a

new treatment facility in North Gulfport that could possibly reduce West Biloxi's existing treatment load. The city of Gulfport's current contribution of wastewater to the West Biloxi plant could be redirected to the North Gulfport WWTP, creating an additional 2.0 to 2.5 mgd of capacity at West Biloxi. Even with the added capacity, however, West Biloxi would be unable to satisfy wastewater demands under peak conditions. Additionally, all of HCWSWMD's wastewater users, including the city of Gulfport, share in the capital financing of treatment facilities. The users effectively own a portion of the physical plant of the treatment system, making the diversion of wastewater flows administratively and financially difficult (personal communication, P. Vanderfin, Enforcement Officer, HCWSWMD, Gulfport, MS, to E. Drake, EDAW, Atlanta, GA, October 1, 1999).

The newly upgraded Keegan Bayou WWTP in east Biloxi has sufficient capacity to accommodate projected average daily wastewater flows from Alternatives 2, 4, or 5. As shown in Figure 3.9-1, routing to this facility, however, would require extensive line construction along US 90. Approximately 31,152 linear feet of 20-inch piping would be used to pump wastewater from the site to the Keegan Bayou facility (personal communication, J. Harris, Ivey, Harris, and Walls, Inc., Winter Park, FL, to J. Napoli, President Casinos, Pittsburgh, PA, December 21, 1998). This option would likely produce more of the direct impacts associated with utility construction, such as soil erosion, short-term disruptions to the road network and existing utility services, and increases in localized traffic congestion during line installation.

The third possible treatment option is construction of an on-site wastewater plant. The high water table along the coast would prevent the use of an absorption disposal system. Similarly, the Permit Board would be unlikely to approve of any direct discharge of effluent into the Back Bay or into the Mississippi Sound north of the barrier islands. The most feasible on-site option would be a zero-discharge or totally closed system in which all effluent is treated to at least tertiary standards and then re-used for irrigation on the golf course and other land areas. Spray irrigation, however, would likely require more land than available on the existing Broadwater site (Ivey, Harris, and Walls, Inc., 1998). The plant would have to pump effluent to off-site areas for land application (personal communication, G. Odom, MDEQ, Jackson, MS, to E. Drake, EDAW, Atlanta, GA, October 29, 1999). Additional site-specific study, however, would be required to determine specifications for plant construction, operation, and proper effluent disposal.

There are two possible financing and operating scenarios for on-site treatment. First, the applicant would bear the initial capital costs of plant construction and would retain control over the treatment process. Alternatively, an entity other than the applicant could assume responsibility for the construction, ownership, or operation of the on-site facility. The HCWSWMD has the authority to treat wastewater produced in the county. The HCWSWMD's legal responsibility to control flows generated by a private facility, however, is uncertain (personal communication, G. Odom, MDEQ, Jackson, MS, to E. Drake, EDAW, Atlanta, GA, October 29, 1999). Regardless of its established authority to treat flows from the Broadwater site, the HCWSWMD would participate in the selection of a wastewater management option for the Proposed Action or its alternatives. The Permit Board would accept an on-site treatment system subject to approval and comment from the HCWSWMD and appropriate coordination

between the HCWSWMD, the applicant, and other authorities (personal communication, G. Odom, MDEQ, Jackson, MS, to P. Leonard, EDAW, Atlanta, GA, April 2, 2000).

On-site treatment would reduce some of the direct impacts associated with the installation of new sewer lines along public rights-of-way and the construction of lift stations. Since the system is zero-discharge, no additional wastewater flows would be conveyed to treatment facilities and existing plant capacity would not be reduced.

There are no significant regulatory barriers to MDEQ approval of any of the three wastewater-treatment alternatives. Each of the off-site pumping and on-site options is feasible and could be granted a state operating permit (personal communication, G. Odom, MDEQ, Jackson, MS, to E. Drake, EDAW, Atlanta, GA, October 29, 1999). The choice between wastewater treatment options would likely be based on negotiations and coordination between the applicant, the city of Biloxi, and the HCWSWMD.

Alternative 3

Alternative 3 would also generate 1.63 mgd in average daily wastewater flow and 4.90 mgd in peak flow. The sites are in proximity of the Keegan Bayou plant, which would have sufficient capacity to satisfy this projected wastewater demand. Because total wastewater demand would be dispersed among multiple sites, Alternative 3 would be more likely to use the existing city collection system (personal communication, J. Porche, City Engineer, City of Biloxi, MS, to E. Drake, EDAW, Atlanta, GA, September 30, 1999). System upgrades at all of the sites, however, would be necessary. Sewer infrastructure in the Bayview Avenue area of the peninsula is designed primarily for residential use. Alternative 3 would require an upgrade of existing sewer line sizes to a minimum of 12 inches and an increase in the capacity of lift stations, particularly in the northern area of the peninsula (personal communication, J. Vorpahl, City of Biloxi, MS, to E. Drake, EDAW, Atlanta, GA, December 9, 1999).

The Bayview Avenue project (see Figure 3.8-3) may provide opportunities to coordinate system improvements with road widening construction, thereby limiting some of the direct impacts of utility installation.

No-Action Alternative

The No-action Alternative would generate approximately 0.12 mgd in average daily wastewater flow, with an average daily peak of 0.35 mgd. This estimated no-action demand is based on current hotel, food and beverage, gaming, and marina space at the Broadwater site. Under the No-action Alternative, some rehabilitation and facility additions could occur at the existing Broadwater site. These improvements could increase wastewater demand and, therefore, require improvements to the city sewer system. Wastewater flows would not, however, be of the volume generated by Alternatives 2, 3, 4, or 5, and any corresponding infrastructure improvements would be less extensive. There is no assumed reduction in existing WWTP capacity under the No-action Alternative.

4.9.2.2 Indirect and Cumulative Impacts

The indirect and cumulative effects of increased wastewater generation from the Proposed Action or its alternatives would include: changes in the overall capacity of the wastewater treatment system in the city of Biloxi, as well as additional demand placed on the existing wastewater treatment system as a result of secondary growth. Section 4.3 evaluates the water quality effects of increased wastewater discharge.

Higher wastewater demand associated with the Proposed Action and other alternatives could affect the city of Biloxi's and the HCWSWMD's ability to provide wastewater treatment services to other users. Increased demand on project sites could reduce the available capacity of infrastructure that collects and transports wastewater from nearby properties. This reduced infrastructure capacity could increase the risk of wastewater seepage from the sewer pipes into the ground or sewer overflow. The Proposed Action and alternatives, however, could also cause the city to expand wastewater collection and treatment capabilities. Wastewater generation at project sites would require infrastructure improvements, such as new lift stations or the installation of larger sewer lines. These system upgrades would provide additional wastewater collection capacity to nearby sites in the municipal system. Funds generated through gaming tax revenues and utility fees could finance these future system upgrades. Any increase in WWTP capacity resulting from the Proposed Action or its alternatives would also provide additional wastewater treatment capability to other users in the HCWSWMD.

The Proposed Action and its alternatives would contribute to permanent population increases. Population growth would produce higher overall wastewater generation across the three-county region. Some portion of the additional wastewater produced by the alternatives would be treated through individual on-site disposal systems, such as septic tanks. Section 4.3 addresses the impacts of increased septic use resulting from secondary growth. The remaining portion of additional wastewater would be collected and treated by centralized WWTP facilities in Harrison, Hancock, and Jackson counties.

This analysis estimates growth in wastewater flows treated by municipal WWTPs. Assumptions used in the formula to calculate estimates are: per capita WWTP flows of 99.44 gal/d in Hancock County; 181.54 gal/d in Harrison County; and 33.38 gal/d in Jackson County. Per capita flows are based on the 1998 total of average monthly wastewater flows received by treatment plants in each county and the 1998 county population. WWTP flows include wastewater generated by household, commercial, and industrial uses.

Table 4.9-3 presents estimated increases in wastewater flow received by centralized treatment plants in the three-county region between 2000 and 2010. The baseline wastewater flow of 42.44 mgd for the three-county region is calculated from the per capita wastewater generation rates in each county and 2000 population projections. Increases for each alternative represent growth in 2010 wastewater flows over this baseline. Under the No-action Alternative, growth in wastewater flow would be a function of continuing population growth trends in the three-county region. Wastewater increases for Alternatives 2, 3, 4, and 5 reflect this continuing population growth, combined with the additional population impact that would be produced by each

alternative. The table also presents the percentage of current permitted treatment capacity in the three-county region that would be needed to satisfy this increased wastewater demand. This analysis does not assume any increase in the regional wastewater treatment capacity. Municipal wastewater utilities will, however, likely continue the expansion of sewer and wastewater infrastructure in response to population growth.

Table 4.9-3
Projected Increases in Wastewater Treatment Plant Flows

Alternative	Projected Increase in WWTP Flows in ROI, 1998-2010 (in mgd)	Increase over No-Action WWTP Flows (in mgd)	Percent of Current Wastewater Capacity in ROI Needed to Serve Increased Flows from Alternative[1]
1	5.3	0	8.4%
2	8.6	3.3	13.7%
3	8.6	3.3	13.7%
4	8.6	3.3	13.7%
5	8.6	3.3	13.7%

Source: Staff analysis.
1. Overall wastewater treatment capacity in ROI is equal to 62.9 mgd - the total permitted treatment capacity of WWTPs in Harrison, Jackson, and Hancock Counties.

Alternatives 2, 4, and 5

Alternatives 2, 4, and 5 would require extensive infrastructure improvements at the Broadwater site. The addition of new force main lines and lift stations, which would be required if wastewater were pumped to a WWTP, would enhance the collection capability of the city's network on the west side of the peninsula. If wastewater treatment facilities were expanded to accommodate projected wastewater flows, then additional treatment capacity would be available to other users in the HCWSWMD. Upgraded plant capabilities could reduce reliance on individual on-site systems and provide improved treatment of wastewater before discharge. The use of an on-site system disposal system would have a minimal impact on available treatment capacity. The system would contribute no wastewater flows to the city's sewer system or wastewater treatment plants. Wastewater would be treated to tertiary standards and effluent would be reused in land application.

Induced growth from Alternatives 2, 4, and 5 would produce an increase of nearly 9 mgd in wastewater flows received at WWTPs in the three-county region by 2010. These alternatives would add approximately 3.3 mgd or about 45 percent to the flows that would be generated under the No-action Alternative. This increase would use approximately 14 percent of current total treatment capacity. As discussed in Section 3.9, regional WWTP capacity would be sufficient to satisfy increased treatment needs.

Alternative 3

Under Alternative 3, sewer system improvements at the declustered sites, such as increased sewer main size, would enhance wastewater collection capacity in east Biloxi. Alternative 3 is not, however, expected to result in WWTP expansion and additional treatment capabilities. The Keegan Bayou plant has sufficient capacity to accommodate projected wastewater flows.

Alternative 3 would produce a wastewater impact in the three-county region comparable to Alternatives 2, 4, and 5, generating an increase of about 9 mgd in flows received at WWTPs in the three-county region. Alternative 3 would increase no-action wastewater flows by over 3 mgd or 45 percent. By 2010, an additional 14 percent of current total treatment capacity would be used to satisfy wastewater levels associated with Alternative 3.

No-Action Alternative

Under the No-action Alternative, localized increases in wastewater demand and infrastructure upgrades could occur at the existing Broadwater site as the result of future improvements and facility expansions. These improvements, however, would not be of the magnitude of the Proposed Action or other alternatives and, therefore, would have less impact on the overall city and county wastewater system. The No-action Alternative would not be expected to reduce or expand the capacity of the current wastewater collection and treatment infrastructure.

Under the No-action Alternative, wastewater treatment demand in the three-county ROI would expand as a result of expected population growth. The estimated increase in wastewater flows received at municipal WWTPs by 2010 is 5.3 mgd or approximately 8.4 percent of the available permitted treatment capacity in the three-county region. This increase would not significantly diminish available regional treatment capacity.

4.9.3 Impacts on Stormwater

This section assesses the capacity of existing infrastructure to accommodate future stormwater runoff that would be generated by the Proposed Action and its alternatives. Section 4.3 addresses the surface water quality impacts of increased runoff. Direct impacts are defined as increases in stormwater runoff and effects on infrastructure (stormwater drains, pipes, culverts, and outfalls) and related issues of flooding resulting from development on the project sites. Indirect impacts are those associated with commercial redevelopment around the project sites and secondary growth in the three-county region induced by the Proposed Action and its alternatives.

4.9.3.1 Direct Impacts

The primary direct effect of the Proposed Action and its alternatives would be an increase in the rate and volume of stormwater discharged from project sites during larger storm events. These increases would occur as a result of conversion of existing undeveloped land to impervious surface, as well as the creation of new land with impervious surfaces. Increases in impervious surfaces and peak stormwater flow for the 10-year storm event (Type III distribution rainfall distribution) were modeled to depict ultimate build-out conditions. The ROI for stormwater analysis includes an area defined by the MDMR for the analysis of stormwater in a letter dated December 15, 1998. The MDMR-defined stormwater analysis area shown in Figure 3.3-6.

Alternatives 3, 4, and 5 are conceptual; detailed hydrology studies were not performed and stormwater flows were not computed. However, the change in impervious surfaces was calculated, providing a comparative measure of the new stormwater runoff that would be generated by each alternative. Changes in impervious surface serve as indicators of runoff levels after development; larger amounts of impervious cover would produce higher runoff quantities.

Table 4.9-4 provides the results of analyses for a 10-year storm event under Alternative 2. The changes in stormwater runoff for smaller storm events and their relationship to stormwater best management practices (BMPs) are discussed below on a qualitative basis.

Table 4.9-4
Change in Impervious Surface and Stormwater Runoff under Alternative 2

	No-Action	Alternative 2	Change Due to Alternative 2
Impervious Surface	184.9 acres	257.9 acres	73 acres
Peak Flow for 10-Year Storm	1,180 cfs	1,686 cfs	506 cfs

Source: Baker and staff analysis.

Table 4.9-5
Change in Impervious Surface at Broadwater Site for the Proposed Action and Alternatives

Alternative	Existing Impervious Surface (acres)	Impervious Surface Added (acres)	Total Impervious Surface
No-Action	184.9	0	184.9
2	184.9	73.0	257.9
4	184.9	43.1	228.0
5	184.9	51.2	236.1

Source: Baker and staff analysis.

Table 4.9-6
Change in Impervious Surface at Alternative 3 Sites

Site	Existing Impervious Surface (acres)	Impervious Surface Added by Alt 3 (acres)	Impervious Surface under Alt 3 (acres)
A	5.5	0.8	6.3
B	4.6	3.8	8.4
C	11.0	18.4	29.3
D	2.6	0.7	3.3
E	2.1	6.9	9.0
F	1.9	1.6	3.5
Total	27.7	32.2	59.8

Source: Baker and staff analysis.

Alternative 2

The Broadwater site and its adjacent parcels are largely developed, so the percentage of the site consisting of impervious surfaces is already high and runoff is near maximum levels. Alternative 2 development would add 73 acres of impervious surface to the area and produce an increase of 506 cfs in stormwater runoff over current peak discharge conditions.

Existing stormwater infrastructure within the Broadwater property and along US 90 (within the Broadwater site) would not be adequate to accommodate the new stormwater amounts produced by additional impervious cover (personal communication, M. Pirrello, M. Baker, Alexandria, VA, to P. Leonard, EDAW, Atlanta, GA, December 23, 1999). An entirely new stormwater infrastructure in the area would be built, as described in Appendix D, including new drains, infiltration basins, detention, and piping structures. The result would be a substantial improvement of stormwater infrastructure on the Broadwater site and along US 90 in front of the Broadwater site.

As discussed in Section 3.9, the city of Biloxi recently upgraded drainage infrastructure north of US 90 by installing larger and longer drainage lines and increasing the size of drain and curb inlets. New stormwater infrastructure associated with Alternative 2 would improve the collection of storm runoff along US 90 and add further drainage capacity to the area, thus reducing the risk of flooding events.

Although peak stormwater flows for the 10-year storm would increase, the peak flows for other more common storm events would decrease. This reduction in peak stormwater flows would be the result of proposed stormwater management (SWM) plans, described in Appendix D, that would exceed the current criteria of MDEQ and the city of Biloxi. The stormwater management system and BMPs (i.e., infiltration basins, stormwater wetlands) would be designed to provide treatment of the first one inch of runoff from all vehicular impervious areas (parking lots, parking decks, roadways, and bridges, including US 90). In addition to providing water quality control by collecting and treating the first one inch of rainfall, BMPs would also result in substantial reduction of existing peak stormwater flows for all storms less than one inch and some reduction of storms greater than one inch.

Alternatives 4 and 5

Alternatives 4 and 5 would produce somewhat smaller but mostly comparable increases in impervious the Proposed Action (Table 4.9-5) and, therefore, would produce generally similar increases in stormwater runoff. Alternative 5 would increase impervious surface at the site by approximately 51 acres. Alternative 4 would likely generate the smallest increase in runoff at the Broadwater site by adding 43 acres in impervious cover to existing conditions.

Though specific stormwater management measures have not yet been identified for Alternatives 4 and 5, it is assumed that development of the Broadwater site under these alternatives would entail similar stormwater management measures. Under this assumption, Alternatives 4 and 5 would produce impacts similar to the Proposed Action. The 10-year peak runoff values would increase but somewhat less than the Proposed Action. Improvements in infrastructure and substantial reduction of existing peak stormwater flows for all storms less than 1 inch and some reduction of storms greater than 1 inch would also occur, as with Alternative 2.

Alternative 3

Alternative 3 would result in an increase of approximately 32 acres of impervious surface over existing conditions, producing a corresponding increase in stormwater discharge. Discharge increases would be particularly pronounced at sites C and E, which would be developed with significantly higher amounts of impervious cover. Overall, however, total additional runoff amounts generated by Alternative 3 would not be as large as the increase associated with the 73 new acres of impervious surface under the Proposed Action. Alternative 3 would be somewhat more comparable in stormwater quantity impact to the runoff increase produced by Alternative 4.

As with alternatives at the Broadwater site, development at Alternative 3 sites would have to comply with MDEQ water quality certification standards. The 10-year peak runoff values would

be expected to increase, but lesser rates of peak stormwater runoff would be produced than under the Proposed Action or Alternatives 4 and 5. Improvements in infrastructure and substantial reduction of existing peak stormwater flows for all storms less than one inch and some reduction of storms greater than one inch may also occur. Given the smaller size of its individual parcels, however, development of Alternative 3 may result in less being spent on stormwater management than under the Broadwater site alternatives, as now occurs in Biloxi with other recent casino developments. Additionally, under Alternative 3, further improvement of stormwater collection and management along US 90 would not occur as in Alternatives 2, 4, and 5.

No-Action Alternative

Under the No-action Alternative, some facility renovations and additions could occur at the Broadwater and Alternative 3 sites. Total increase in impervious surfaces and stormwater flows, however, would not be of the magnitude generated by the Proposed Action and other alternatives. Redevelopment of the Broadwater and Alternative 3 sites could trigger more stringent water quality control measures and thus require upgrades to the existing stormwater management system. Water quality measures may not, however, be as rigorous as the devices proposed in the stormwater management plan for the Proposed Action and may provide less effective control of runoff.

4.9.3.2 Indirect Impacts

The primary indirect effect of the Proposed Action and its alternatives would be an increase in the rate and volume of stormwater runoff resulting from commercial redevelopment around the project sites (i.e., in the MDMR-defined stormwater analysis area), and secondary growth in the three-county region.

Alternative 2, 3, 4, and 5

Improvements to parcels adjacent to the Broadwater or Alternative 3 sites would likely add impervious surface and, therefore, increase stormwater runoff. Since much of the surrounding area near the project sites is already developed, induced development would not significantly increase impervious surface and associated runoff. Additionally, redevelopment of the adjacent properties would trigger more stringent stormwater controls in many cases. These improved stormwater management measures would reduce the impacts of increased runoff. State and local requirements for infrastructure upgrades would control many of the negative impacts on stormwater infrastructure.

Secondary growth associated with the alternatives could also alter stormwater hydrology across the three-county region by increasing development and impervious surfaces. State and local regulations that require new infrastructure to meet additional stormwater flows, however, would reduce the effects of increased runoff.

No-Action Alternative

Under the No-action Alternative, some facility renovations and additions could occur, triggering development on surrounding parcels. This induced development would not be of the magnitude generated by the other alternatives. The No-action Alternative, therefore, would have a minor impact on increased runoff levels. This alternative, however, would not produce the water quality benefits associated with improved stormwater management infrastructure at redeveloped sites.

Under the No-action Alternative, stormwater hydrology in the three-county region would be affected by continuing regional population growth. This alternative, however, would generate development levels less than Alternatives 2, 3, 4, and 5 and, therefore, would not have as much of an impact on regional stormwater runoff conditions.

4.9.4 Impacts on Solid Waste and Hazardous Waste

This section assesses the environmental effects of the Proposed Action and its alternatives on the solid waste and hazardous waste system. The ROI used to evaluate these impacts includes the sites of the Proposed Action and its alternatives and the three-county region.

The potential direct effects of the Proposed Action and its alternatives would include additional demand placed on available landfill capacity resulting from increased C & D and non-hazardous commercial waste production, and possible environmental conditions created by on-site hazardous materials.

Alternatives 2, 4, and 5

Alternatives 2, 4, and 5 would generate additional volumes of C & D and solid waste material. This increased waste stream, however, would not be expected to strain available disposal capacity. There are no major constraints on the capacity of C & D facilities in the three-county region to accommodate waste produced during construction activities (personal communication, P. Vanderfin, HCWSWMD, Gulfport, MS, to E. Drake, EDAW, Atlanta, GA, October 1, 1999). Given the limited capacity of the nearby Pecan Grove facility, solid waste generated during operational phases of the project would likely require disposal at more geographically distant landfills in Louisiana and Alabama. Waste disposal at out-of-state facilities would be associated with increased truck travel, higher transportation and disposal fees, and the possible construction or expansion of waste transfer facilities. Discussions with solid waste service providers, however, indicate that private market arrangements would continue to satisfy increased demand for commercial waste collection and disposal.

The Broadwater site has limited hazardous material impacts. As long as construction activities do not disturb the non-functioning septic system on the upland portion of the site, the tanks should not pose any significant threat to the environment. If the septic systems must be excavated, however, the use of BMPs would be recommended (personal communication from H. Mueller, Chief, Office of Environmental Assessment, EPA, Region 4 to S. Rees, Mobile District,

Corps of Engineers, March 9, 2000). Under the Proposed Action, existing USTs at the Broadwater marina would be removed in compliance with EPA and MDEQ regulations (Baker, 1998a). A "Demolition/Renovation Notification Form" as referenced in 40 CFR 61 Subpart M would be submitted to MDEQ before removal of asbestos (Baker, 1998a). Asbestos abatement would be designed by a Mississippi Certified Asbestos Contractor. These actions would improve environmental quality by eliminating known hazards in compliance with state and federal standards.

Alternative 3

Alternative 3 would also generate additional volumes of C & D and solid waste material. As with the other alternatives, the increased waste stream associated with both construction and operation activities would not be expected to strain available disposal capacity.

As discussed in Section 3.9, assessments reveal potentially significant environmental conditions at Sites D and E. Development at these sites would require additional study to ensure that potentially hazardous materials and substances are safely eliminated.

No-Action Alternative

Under the No-action Alternative, some rehabilitation and facility additions may occur at the existing Broadwater site. These improvements could result in C & D production and increased solid waste management demand. Waste volumes would not, however, be of the magnitude generated by the Proposed Action. The No-action Alternative, therefore, would have a minor impact on C & D and MSW landfill capacity.

Under the No-action Alternative, Broadwater the site may not undergo any of the corrective actions triggered by new construction activity, such as the elimination of asbestos from resort buildings.

The primary indirect effect of the Proposed Action or its alternatives would be increased C & D and solid waste generation resulting from induced population growth and commercial development. There are no anticipated constraints on C & D capacity and sufficient MSW disposal can be accessed. This indirect effect, therefore, is expected to be minor.

4.9.5 Impacts on Telecommunications and Energy Systems

This section assesses the anticipated environmental effects of the Proposed Action and its alternatives on telecommunications and energy systems. The ROI used to evaluate these impacts includes the sites of the Proposed Action and its alternatives and the three-county region.

4.9.5.1 Impacts on System Capacity

The primary direct impacts of the Proposed Action and its alternatives on telecommunications and energy systems would be increased utility demand at project sites. As an indirect impact, the Proposed Action and its alternatives would increase utility demand across the three-county region as a result of secondary growth.

Higher telecommunications, electrical, and gas use generated by the Proposed Action and its alternatives would require on-site improvements to the existing distribution system, such as the installation of fiber optic cable and copper bundles, the possible addition of an electrical substation, and an increase in the size of gas pipelines supplying the sites. As with all utility upgrades, these improvements would produce short-term direct environmental impacts, including the acquisition of utility rights-of-way and construction easements, the relocation of existing utility lines, the use and storage of heavy construction equipment, soil erosion resulting from the digging of utility trenches, and possible disruptions to the road network and existing utility services.

Alternatives 2, 3, 4, and 5

These alternatives would generate additional telecommunications, electrical power, and natural gas use. This increased demand would require certain on-site infrastructure improvements. System upgrades would result in the minor, temporary impacts associated with utility installation at the project sites. The delivery of additional telecommunications, electricity, and gas services, however, would not produce any adverse long-term impacts on system capacity or require construction of additional generating or other capacity. As described in Section 3.9, discussions with service providers indicate no anticipated constraints on the expansion of telecommunications and energy infrastructure. BellSouth, Mississippi Power, and Entex would satisfy increased demand for communications and energy utilities during operational phases. Adequate infrastructure expansion would require detailed calculations of telecommunications and power needs and sufficient time for developing system layouts.

The primary indirect effect of the Proposed Action and its alternatives would be increased telecommunications and energy use resulting from induced population growth and commercial development. There are no anticipated constraints on telecommunications, electrical, and natural gas delivery, and sufficient capacity exists throughout the coastal area. This indirect effect, therefore, would be minor.

No-Action Alternative

Under the No-action Alternative, some rehabilitation and facility additions could occur at the existing Broadwater site. These improvements could result in increased telecommunication and energy demands. Utility use would not, however, be of the magnitude generated by the Proposed Action. The No-action Alternative, therefore, would have a minor direct impact on telecommunications and energy system capacity.

Under the No-action Alternative, telecommunications and energy use would increase in response to continuing population growth and development. Given the capacity of utility systems to expand, however, this increase would have a minor impact.

4.9.6 Mitigation

Overall, the affected infrastructure systems would have sufficient capacity or could be expanded as necessary to accommodate the projected utility demands of the Proposed Action or its alternatives. Increased service demands may result in expenditures to construct new facilities or improve existing infrastructure. As the controlling local authority, the city of Biloxi may participate along with the developer in the funding of system upgrades when the improvements provide public benefit (personal communication, E. Shambra, City of Biloxi, MS, to E. Drake, EDAW, Atlanta, GA, April 14, 2000).

As a condition of permit approval (Permit No. DMR-M-99101-Z) for construction activities at the Broadwater site, the MDMR has stipulated that the applicant assume the full burden of costs associated with implementation of a wastewater treatment plan, including upgrades to plant capacity, installation of sewer mains or pump stations, and other miscellaneous costs. Additionally, according to permit conditions, all public system upgrades would be turned over to the city of Biloxi for ownership following completion.

A determination of specific arrangements for the funding, ownership, and management of any proposed infrastructure improvements, including wastewater treatment, would be subject to discussion and agreement between the applicant, the city of Biloxi, and other appropriate controlling local entities, such as the Harrison County Wastewater and Solid Waste Management District.

Specific funding and management arrangements for infrastructure improvements cannot be determined at this time. Though a range of infrastructure options remains possible, certain mitigation measures should be included with any alternative. Alternatives 2, 3, 4, and 5 would all result in increased groundwater withdrawals and wastewater generation. Recommended measures would be to ensure proper wastewater treatment, use of water conservation approaches to reduce projected demands on the water and wastewater systems, and planning for future system expansion.

As stipulated in the MDMR permit, the applicant should submit a wastewater treatment plan for the project that is acceptable to the city of Biloxi and/or the HCWSWMD. Water conservation strategies, such as the use of xeriscaping and water-efficient fixtures, or the re-use of gray water, would reduce the impacts of potable water demand. Additionally, the applicant should fully participate in any proposed citywide study of potable water needs.